

Claims

1. A method for producing an automobile assembly comprising a structural member made of a moulded plastics material having a low energy surface and a reinforcing

5 member attached to the structural member, the members having complementary surfaces, which comprises applying an adhesive to the complementary surface of the structural member and/or reinforcing member, bringing the complementary surfaces of the reinforcing member and structural member into contact and allowing the adhesive to set so as to bond the structural member and reinforcing member together wherein the adhesive is

10 capable of bonding to a low energy surface plastic.

2. A method according to Claim 1 in which the low energy surface plastics material has a surface energy of less than 45 mJ/m².

3. A method according to Claim 1 in which the plastics material comprises a homopolymer selected from a polyolefin, a polystyrene and a polyamide or a copolymer.

15 4. A method according to Claim 1 in which the plastics material comprises fibre.

5. A method according to Claim 4 in which the fibre is selected from short glass fibre, long glass fibre, short natural fibre or long natural fibre.

6. A method according to Claim 1 in which the plastics material is selected
20 from short glass fibre filled polypropylene, long glass fibre filled polypropylene, glass filled polyamide and glass filled polyamide alloys.

7. A method according to Claim 1 in which the reinforcement is made of steel and/or aluminium.

25 8. A method according to Claim 1 which comprises applying the adhesive directly to the surface of the structural member without treatment or priming of the said surface.

9. A method according to Claim 1 in which the structural member and reinforcing member are bonded together by a continuum of adhesive along the complementary surfaces on the two members.

10. A method according to Claim 1 in which the reinforcing member 5 comprises contours or channels which are complementary with the surface of the structural member so as to provide resistance to stress by means of adhesion and/or abutment between the structural and reinforcing member.

11. A method according to Claim 1 in which the adhesive comprises a polymerizable composition.

10 12. A method for producing an automobile assembly comprising a structural member made of a moulded plastics material having a low energy surface and a reinforcing member attached to the structural member, the members having complementary surfaces, which comprises providing an adhesive comprising a polymerizable composition, contacting together the components of the composition under conditions to initiate 15 polymerization, applying the adhesive to the complementary surface of the structural and/or reinforcing member, bringing the complementary surfaces of the reinforcing member and structural member into contact and curing the adhesive whereby the said members bond together.

13. A method according to Claim 11 or Claim 12 in which the 20 polymerizable composition comprises an organoborane/amine complex and one or more of monomers, oligomers or polymers having olefinic unsaturation which is capable of polymerization by free radical polymerization.

14. A method according to Claim 13 in which the polymerizable composition further comprises a compound which causes the said complex to disassociate 25 so as to release the organoborane to initiate polymerization of one or more of monomers, oligomers or polymers having olefinic unsaturation.

15. A method according to Claim 13 in which the amine part of the organoborane/amine complex is selected from the group of amines having an amidine

structural component; aliphatic heterocycles having at least one nitrogen in the heterocyclic ring; primary amines which in addition have one or more hydrogen bond accepting groups wherein there are at least two carbon atoms between the primary amine and the hydrogen bond accepting group; and conjugated imines.

5 16. A method according to Claim 15 in which the amine is selected from dimethylaminopropyl amine, methoxypropyl amine, dimethylaminoethylamine, dimethylaminobutylamine, methoxybutyl amine, methoxyethyl amine, ethoxypropylamine, propoxypropylamine, amine terminated polyalkylene ethers (such as trimethylolpropane tris(poly(propylene glycol), amine terminated)ether), aminopropylmorpholine, 10 isophoronediamine, and aminopropylpropanediamine.

17. A method according to Claim 13 in which the organoborane part of the organoborane/amine complex is selected from a trialkyl borane and an alkyl cycloalkyl borane.

18. A method according to Claim 17 in which the organoborane is selected 15 from tri-ethyl borane, tri-isopropyl borane and tri-n-butylborane.

19. A method according to Claim 13 in which the molar ratio of amine compound to organoborane compound is from 1.0:1.0 to 3.0:1.0

20 20. An automobile assembly comprising a structural member made of a moulded plastics material having a low energy surface and a reinforcing member attached to the structural member, the structural member and reinforcing member having complementary surfaces and being attached by means of an adhesive, which is capable of bonding to a low energy surface substrate, on at least part of one or both of the complementary surfaces.

21. An automobile assembly comprising a structural member made of a 25 moulded glass filled polypropylene and/or glass filled polyamide having a surface energy of less than 45 mJ/m², and a reinforcing member made from steel, zinc and/or aluminium attached to the structural member, the structural member and reinforcing member having complementary surfaces and being attached by means of an adhesive which is capable of

bonding to a substrate having a surface energy of less than 45 mJ/m² disposed between at least part of the complementary surfaces so as to bond them together, the adhesive being derived from a polymerizable composition comprising

i) an organoborane/amine complex;

5 ii) one or more of monomers, oligomers or polymers having olefinic unsaturation which is capable of polymerization by free radical polymerization; and, optionally

10 iii) a compound which causes the said complex to disassociate so as to release the borane to initiate polymerization of one or more of monomers, oligomers or polymers having olefinic unsaturation.

22. An automobile assembly according to any one of Claims 20 and 21 wherein the assembly comprises a front end carrier being that part of the body of an automobile which joins two sides of the automobile together at the front or rear of the automobile and which is aligned transversely so as to define a compartment.

15 23. An automobile assembly according to any one of Claims 20 and 21 wherein the assembly comprises a bumper system in which:

i) the reinforcing member is an energy absorbing unit made of metal or plastics material and the structural member is a bumper fascia made of plastics material; or

20 ii) the reinforcing member is a bumper beam made of metal and the structural member is an energy absorbing unit made of plastics material..

24. An assembly according to Claim 23 in which the energy absorbing unit has a generally "C" shaped cross section.